

The Examiner rejects claim 9 under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner questions how the separator can comprise the rib if it is applied to the electrode plate. The Examiner states that claim 9 further recites "A rolled-up battery separator" which is "cut into pieces for insertion in said battery". However, claim 9 contains no such language; claim 13 recites this language. By the accompanying amendment, claim 9 has been cancelled to expedite allowance.

The Examiner's objection (presumably to claim 13) centers around the fact that the specification does not support a separator that is both "rolled-up" and "cut into piece". However, claim 13 recites that the separator is adapted to be cut into pieces, meaning that it is merely capable of being cut into piece, not that it is cut into pieces when in its rolled-up form. The separators of the present invention are produced by first molding the separator material into a belt-like sheet, for instance by use of an extruder, followed by passing the extruded separator material through at least one pair of calender rolls, which form the studs and ribs. The separator is then subjected to an extraction process followed by a drying step in order to produce a porous belt-like sheet (page 8, last paragraph). Although the belt-like separator initially formed can be directly cut into pieces having the size needed for pocket formation (page 8, last paragraph), usually the belt-like separator is cut into the width needed for pocket production and then rolled up (page 10, fourth paragraph), i.e., in the first cutting step the initial belt-like separator is cut into several belt-like separators having the required width. The belt-like separators cut-to-width are then rolled up and delivered to the customer who cuts the belt-like separator into length for pocket-production. Once cut into pieces, the separator is not rolled up again. It is believed that claim 13 is therefore sufficiently definite.

The Examiner newly rejects claims 1-3, 5, 7, and 11-15 under 35 U.S.C. §102(b) as being anticipated by Nakano et al., EP 0541124 A2, and claim 9 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being unpatentable over Nakano et

al., EP 0541124 A2. The Examiner states that Nakano et al. teach a pocket type separator for a lead acid battery that is made of a synthetic resin such as polyethylene or PVC; that a belt-like porous sheet is obtained and cut into a number of pieces of a predetermined length and in a rectangular shape; and that the separator has a plurality of parallel, vertical projecting ribs 5 and short, intersectant ribs 6 that correspond to the instantly claimed studs. Regarding claim 9, the Examiner admits that Nakano et al. do not explicitly state that the separate rib is applied to the separator sheet, but considers that it would have been obvious to do so.

Nakano discloses pocket type separators which are provided with a plurality of parallel, vertical ribs in a middle region of the separator surface and a plurality of intersectant, vertically spaced ribs on the left and right side end portions of the separator surface.

In order to further distinguish the present invention from Nakano, by the accompanying amendment claim 1 has been amended to specify that the plurality of studs is present at least in the center area of the separator sheet. Support for the amendment can be found at page 7, fourth paragraph of the instant specification. Claim 9 has been cancelled.

Separators comprising a plurality of studs in the middle region of the separator sheet are not disclosed or suggested by Nakano. To the contrary, Nakano repeatedly emphasizes that short intersectant ribs are arranged at the left and right marginal regions of the separator surfaces (see, for instance, column 4, lines 10-12, lines 30-33; column 5, lines 27-28, and Figures 1-4), while the center area of the separator is provided with vertical ribs. According to Nakano, the short intersectant ribs serve the purpose of preventing a direct contact of the separator base with the corner edges of the electrode (column 5, lines 27-43), i.e., a purpose which requires the presence of short intersectant ribs only on the side end portions of the separator sheet. The middle regions of the separator are provided with vertical ribs, which prevent a direct contact of the separator sheet with the front and

rear surfaces of the electrodes (column 5, lines 1 to 26) and therefore no short intersectant ribs are needed in the center area. Nakano explains that the vertical ribs form vertical grooves which allow any gas generated in the battery to escape (column 5, lines 15-22) and thus Nakano teaches away from the use of short intersectant ribs in the center area of the separator sheet. It follows that Nakano does not teach or suggest separators which are provided with at least one vertical rib and a plurality of studs in the middle region of the separator sheet as now recited in amended claim 1.

The Examiner rejects claim 8 under 35 U.S.C. §103(a) as being unpatentable over Nakano in view of Young, U.S. Patent No. 5,665,488. The Examiner cites Young for its teaching of a separator comprising a sheet of a microporous polyolefin material and a rib core forming material wherein the rib core material is a thermoplastic, thermosetting polymer or reactive hot melt, whereas the separator is a polyolefin such as polyethylene. The Examiner concludes that it would have been obvious to form the rib of Nakano out of a different material in view of Young.

Claim 8 is believed to be allowable by virtue of its dependence, for the reasons articulated above. Thus, Young et al. does not supply the aforementioned deficiencies of Nakano regarding the at least one vertical rib and a plurality of studs in the center area of the separator sheet.

The Examiner also newly rejects claims 1-7, 9 and 11-15 under 35 U.S.C. §103(a) as being unpatentable over Knauer, U.S. Patent No. 5,558,952 in view of Grimes. The Examiner states that Knauer teaches a pocket separator for retaining positive or negative electrode plates in an electric storage battery, formed of a porous sheet having a plurality of continuous vertical ribs, a plurality of broken inclined ribs at the side edges, and a plurality of broken vertical ribs in the center which engage the positive or negative plate. The Examiner admits that Knauer fails to disclose a plurality of studs on at least one side of the separator and at least one elongated vertical rib in a center area, but cites Grimes as disclosing these features.

Knauer teaches pocket separators for lead acid electric storage batteries (column 4, line 1). It is the object of Knauer to avoid the disadvantages associated with vertical ribs, such as misalignment of electrode plates and slow production (column 1, lines 27-42), and it is suggested to provide the separator sheet with a plurality of broken vertical ribs in the center area (column 1, lines 53-57). The side edges of the separator sheet may be provided with a plurality of continuous vertical ribs and a plurality of broken inclined ribs, i.e., vertical ribs are only found in side areas of the separator sheet where they do not impair gas flow and do not cause misalignment of the electrode plates.


Grimes et al. describes separators for zinc-bromine batteries, i.e., batteries with circulating electrolyte. According to Figure 7c, these separators may be provided with a combination of vertical ribs and studs. However, in view of Knauer's intention to avoid the disadvantages associated with vertical ribs which are arranged in the middle area of the separator sheet, one skilled in the art would not have been motivated to modify the separators of Knauer by providing vertical ribs in the center area of the separators as in Grimes et al. Indeed, at best the combined teachings of Knauer and Grimes et al. might have motivated the skilled artisan to use those separator designs of Grimes et al. that are compatible with the teachings of Knauer, such as the separator shown in Figure 7b of Grimes et al. which greatly resembles the separator design suggested by Knauer and which does not comprise vertical ribs in the center area of the separator sheet.

In addition, it is important to note that Grimes et al. are concerned with a totally different type of battery than Knauer. While Knauer describes pocket separators for lead-acid storage batteries (column 4, line 1), Grimes et al. describe separators for zinc-bromine batteries (column 2, lines 11-12). Zinc-bromine batteries are significantly different from lead-acid batteries. As shown in Figure 1 of Grimes et al., zinc-bromine batteries comprise two separate compartments comprising two

different electrolytes which are separately circulated through the battery (Figure 1 and column 4, lines 6-18). The separators used in this system are sheet separators comprising a microporous sheet provided with a non-porous frame (column 5, lines 1-4). Thus, the separators of Grimes et al. are not compatible with the pocket design of Knauer and, therefore, one skilled in the art would not look to Grimes et al. to modify Knauer, and would not be motivated to modify Knauer in any way. Applicants respectfully submit that the combination of Figure 7c of Grimes et al. with the teachings of Knauer is based on impermissible hindsight reconstruction and ignores Knauer's intention to avoid the disadvantages associated with vertical ribs.

Reconsideration and allowance are respectfully requested in view of the foregoing amendment and remarks.

Respectfully submitted,


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Version with Markings to Show Changes Made

1. (Twice amended) A pocket battery separator for a lead-acid storage battery having a useful life, said separator comprising a microporous sheet made of synthetic resin having a center area and side areas and being provided with a plurality of studs in the center area of [on] at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs, said at least one elongated vertical rib and said plurality of studs remaining on said sheet during said useful life.

9. (cancelled)

15. (Amended) A pocket battery separator for a lead-acid storage battery, said separator being a microporous sheet consisting essentially of a homogeneous mixture of 8 to 100 vol.% [synthetic resin] polyolefin, 0 to 40 vol% plasticizer and 0 to 92 vol. % insert filler, said sheet having a center area and side areas and being provided with a plurality of studs on at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs.



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TC 1700

Replacement Sheet

1. (Twice amended) A pocket battery separator for a lead-acid storage battery having a useful life, said separator comprising a microporous sheet made of synthetic resin having a center area and side areas and being provided with a plurality of studs in the center area of at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs, said at least one elongated vertical rib and said plurality of studs remaining on said sheet during said useful life.

9. (cancelled)

15. (Amended) A pocket battery separator for a lead-acid storage battery, said separator being a microporous sheet consisting essentially of a homogeneous mixture of 8 to 100 vol.% polyolefin, 0 to 40 vol% plasticizer and 0 to 92 vol.% insert filler, said sheet having a center area and side areas and being provided with a plurality of studs on at least a first side of the sheet, characterized in that the separator additionally comprises at least one elongated vertical rib in the center area of at least said first side of the sheet provided with a plurality of studs.